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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 09/843,882
Filing Date: April 30, 2001
Appellant(s): ALVAREZ ET AL.

Timothy B. Kang
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed on June 1, 2005 appealing from the Office action mailed on January 3, 2005.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to Be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

The following is a listing of the evidence (e.g., patents, publications, Official Notice, and admitted prior art) relied upon in the rejection of claims under appeal.

U.S. Patent No. 6,636,951	TACHIKAWA	Oct. 21, 2003
U.S. Patent No. 6,230,239	SAKAKI et al.	May 8, 2001

Microsoft Press Computer Dictionary, Third Edition (1997), page 179.

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claims 1-23 stand rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Pat. No. 6,636,951 to Tachikawa ("Tachikawa") in view of U.S. Pat. No. 6,230,239 to Sakaki et al. ("Sakaki").

This rejection is set forth in the final Office action mailed on January 3, 2005.

(10) Response to Argument

1. **Claims 1-20** (Brief, pages 10-15)

Appellant contends, "Tachikawa fails to disclose that the rate at which the set of data is moved is modified based on the performance of at least one application as recited in Claims 1, 11, and 16" (Brief, page 11, last paragraph, Appellant's emphasis).

However, Tachikawa expressly discloses monitoring the load condition of the system (see, for example, column 13, lines 6-15). As Appellant recognizes, "data is moved when the load condition is low and is not moved when the load condition is high" (Brief, page 11, first

complete paragraph). In other words, Tachikawa teaches that the rate at which the set of data is moved is modified based on the load condition. It should be noted that the load condition is a measure of performance *per se*, and in fact relates to the performance of at least one application (see, for example, column 10, lines 51-63). For example, Tachikawa discloses that a high load condition is the result when "a large amount of data [is] simultaneously read out from the data storage section 17 for a short period of time" (column 10, lines 54-56). Here, the data is read out from the data storage section by at least one application, such as the data relocation section 16 (see, for example, column 10, lines 23-25). Tachikawa discloses that the CPU 21 executes a program to implement the data relocation section (see, for example, column 8, lines 1-5). Therefore, the load condition is indeed the performance of at least one application. Tachikawa thus teaches that the rate at which the set of data is moved is modified based on the performance of at least one application.

Appellant similarly contends, "Sakaki et al. does not disclose that a performance of at least one executing application monitored at all" (Brief, page 12, second complete paragraph).

However, Sakaki expressly discloses that the performance of data migration is measured or monitored, including the queuing time of the command chains and the number of contentions for access to the same disk volume (see, for example, step 42 in FIG. 4 and column 7, line 60 to column 8, line 2). The CPU executes a computer program to generate the access to the disk volume (see, for example, column 6, lines 6-9). Sakaki further teaches a data migration control part 17 that issues the command chains (see, for example, column 6, lines 30-33 and 59-61), and again, a computer program implements these operations (see, for example, column 5, lines 15-18). In other words, the performance that Sakaki monitors is the performance of at least one

executing computer program. Therefore, Sakaki, like Tachikawa, teaches monitoring the performance of at least one application.

Appellant contends that cited passages of Sakaki "discuss changes to the rates of the average queuing time and the existence of contentions, respectively, and thus do not discuss calculating a change in the rate at which a set of data is moved in response to a monitored performance of at least one executing application," and that the passages "also fail to disclose that the rate at which the set of data is moved is modified in accordance with the calculated change" (Brief, page 13, first complete paragraph).

However, Appellant recognizes that these changes to the rates are indeed calculated (Brief, page 13, top, emphasis added). Sakaki explains that the calculated rate of change of the queuing time is considered "path resource information" (see, for example, column 8, lines 15-23), and that the calculated rate of change of the contentions is considered "old VOL resource information" (see, for example, column 8, lines 24-31). As presented above, the queuing time and the contentions relate to the performance of at least one application. Sakaki expressly discloses, "Based on the order of the priority of sequence of data migration and the various resource information, a judgment is performed to determine whether migration speed should be changed (Step 47)" (column 8, lines 32-35, emphasis added). The "various resource information" from which Sakaki determines whether to change the migration speed includes the "path resource information" and the "old VOL resource information" noted above, which is to say the values calculated based on the monitored performance of at least one application.

Furthermore, Sakaki expressly discloses, "When the various resource information indicates the tendency of an increase of access by the CPU, the number of tracks to be read in is

reduced or the issuing interval of the command chains issued by the CPU that have been given priority is lengthened" (column 8, lines 43-47, emphasis added). As Appellant recognizes, this describes when and how Sakaki changes the migration speed (Brief, page 13, second complete paragraph). In other words, Sakaki teaches that the migration speed, or the rate at which the set of data is moved, is changed or modified in accordance with the calculated values.

Moreover, Appellant states, "Sakaki et al. discloses that modifications to the migration speed is directly correlated to the access requirements by the CPU to the storage systems" (Brief, page 13, second complete paragraph). Indeed, any access to the storage systems is in response to some command, program or application being executed by the CPU. As presented above, Sakaki monitors the performance of at least one such application to calculate when and how to modify the speed of data migration.

Therefore, notwithstanding Appellant's conclusion to the contrary (Brief, page 13, last paragraph to page 14, top), Sakaki does disclose that a change in the rate at which a set of data is moved is calculated in response to a monitored performance of at least one executing application, and that the rate at which the set of data is moved is modified in accordance with the calculated change.

Appellant similarly contends that the combination of Tachikawa and Sakaki "would fail to yield a controller configured to calculate a change in the rate at which a set of data is moved in response to a comparison of the performance of at least one executing application and a performance goal as set forth in Claim 11" and "would fail to disclose that the controller is configured to adjust the rate at which the set of data is moved in accordance with the calculated change" (Brief, page 14, first complete paragraph).

However, Tachikawa teaches a controller configured to compare the performance of at least one executing application with a performance goal (see, for example, column 9, lines 12-21). Here, Tachikawa expressly discloses a comparison to determine whether "the current load value of the system is equal to or less than a first predetermined load value" (column 9, lines 17-21). As noted above, the current load value or the load condition relates to the performance of at least one executing application. The predetermined load value is considered a performance goal. As further noted above, Sakaki teaches calculating a change in the rate at which a set of data is moved and adjusting the rate at which the set of data is moved in accordance with the calculated change. Therefore, the combination of Tachikawa and Sakaki teaches a controller configured to calculate a change in the rate at which a set of data is moved, indeed in response to a comparison of the performance of at least one executing application and a performance goal, and further configured to adjust the rate at which the set of data is moved in accordance with the calculated change.

2. **Claims 21-23** (Brief, pages 15-16)

Appellant contends that the combination of Tachikawa and Sakaki "would still fail to disclose that an error value for the performance of at least one executing application is calculated and that the error value is used to calculate the change in the rate of the moving as claimed in Claim 21" (Brief, page 15, second complete paragraph). Specifically, Appellant contends that there is nothing in the cited passage of Sakaki "to indicate that a contention value is equivalent to an error value" (Brief, page 15, last paragraph to page 16, top).

However, as known in the art, an "error" is merely an unexpected value or the result of an event that is not completed as expected. See the *Microsoft Press Computer Dictionary*, Third

Edition, which defines an error as "a value or condition that is not consistent with the true, specified, or expected value or condition" and states that "in computers, an error results when an event does not occur as expected or when impossible or illegal maneuvers are attempted" (page 179). Here, Sakaki expressly discloses measuring "contentions for the connection 16 between the new CU 11 and the old CU 13" and "contentions for the same VOL by accesses from the CPU" (column 7, line 63 to column 8, line 2). It should be noted that these disk operations are not completed as expected due to the contentions. In other words, the contentions that Sakaki measures are "errors" *per se* that result when a disk controller cannot access the connection or when the CPU cannot access the disk volume (i.e., not completed as expected). As noted above, Sakaki calculates values based on the contentions to calculate a change in the rate of data migration (see, for example, column 8, lines 15-31). Thus, the contention values (i.e., unexpected values) are considered "error values" used to calculate the change in the rate of moving. Notwithstanding Appellant's characterization that "Sakaki et al. discloses that the migration speed is modified according to the number of accesses attempted on the old and new volumes" (Brief, page 16, first complete paragraph), again, it should be noted that the migration speed is in fact modified in accordance with the calculated values of "various resource information," as noted above.

Appellant further contends that "the Examiner has not provided any motivation for the proposed combination of Tachikawa and Sakaki et al." and "has clearly failed to establish a proper rejection of Claims 21-23 under 35 U.S.C. § 103" (Brief, page 16, second complete paragraph).

However, as suggested in the final Office action mailed on January 3, 2005 (pages 3-4 and pages 7-8), it would have been obvious to one of ordinary skill in the art at the time the invention was made to supplement Tachikawa with the teachings of Sakaki to improve the performance of the data migration and to improve access to the data (see, for example, Sakaki, column 2, lines 55-59). Claims 21 and 22 depend from independent claim 1, and independent claim 23 corresponds to claims 11 and 22.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

The claim rejections set forth in the final Office action mailed on January 3, 2005 are reproduced here for completeness:

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 1-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Pat. No. 6,636,951 to Tachikawa (art of record, hereinafter "Tachikawa") in view of U.S. Pat. No. 6,230,239 to Sakaki et al. (art of record, hereinafter "Sakaki").

With respect to claim 1 (currently amended), Tachikawa discloses a method for migrating data (see, for example, the title and abstract), said method comprising:

(a) moving a set of data in a data storage system of a computer system (see, for example, column 7, lines 40-48, which shows relocating or moving data in a data storage system);

(b) monitoring a performance of at least one executing application, while said moving is in progress (see, for example, column 13, lines 6-15, which shows monitoring the load or performance conditions of the system while moving the data, and column 10, lines 51-63, which shows that the monitored load condition may be associated with an executing application, such as one operative to record and reproduce image data).

Although Tachikawa discloses modifying a rate of said moving in response to said monitoring (see, for example, column 12, lines 7-13 and 34-41, which shows controlling the moving based on the monitored load condition), Tachikawa does not expressly disclose:

(c) calculating a change in a rate of said moving in response to said monitored performance of the at least one executing application; and

(d) modifying said rate of said moving in accordance with said calculated change.

However, Sakaki similarly discloses a method for migrating data (see, for example, the title and abstract). Sakaki further discloses modifying the migration speed, i.e. modifying the rate of moving (see, for example, column 8, lines 32-36), according to changes in rates calculated based on monitored performance (see, for example, column 8, lines 17-23 and 26-31). The data migration of Sakaki enables improved performance and improved access by the CPU (see, for example, column 2, lines 55-59).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to supplement the method of Tachikawa with the features taught by Sakaki, so as to calculate a change in a rate of said moving in response to said monitored performance of the at least one executing application, and modify said rate of said moving in accordance with said calculated change, thereby improving performance and access to the data.

With respect to claim 2 (original), Tachikawa in view of Sakaki further discloses setting a performance goal for said at least one executing application, wherein said rate of said moving is increased in response to said monitoring of said performance exceeding said performance goal (see, for example, Tachikawa, column 9, lines 12-21, which shows setting a predetermined load requirement or goal, and column 12, lines 52-61, which shows performing additional moving if the load is minimal, i.e. increasing the rate of moving if performance exceeds the goal).

With respect to claim 3 (original), Tachikawa in view of Sakaki further discloses setting a performance goal for said at least one application, wherein said rate of said moving is decreased in response to said monitoring of said performance not achieving said performance goal (see, for example, Tachikawa, column 9, lines 12-21, which shows setting a predetermined load requirement or goal, and column 12, line 62 to column 13, line 5, which shows performing less moving if the load is such that less time is available, i.e. decreasing the rate of moving if performance does not achieve the goal).

With respect to claim 4, Tachikawa in view of Sakaki further discloses:

(a) inputting an initial placement of said set of data (see, for example, Tachikawa, column 7, lines 22-33, which shows data location or placement information, and column 11, lines 45-53 and FIG. 5A, which show an initial placement of the data);

(b) inputting a target placement of said set of data (see, for example, Tachikawa, column 7, lines 22-33, which shows data location or placement information, and FIGS. 5B and 5C, which show target placements of the data);

(c) developing a migration plan, said migration plan configured to plan said moving of said set of data from said initial placement to said target placement (see, for example, Tachikawa, column 9, lines 22-31, which shows selecting a relocation program, i.e. a migration plan, in accordance with the placement information); and

(d) executing said migration plan to implement said moving of said set of data (see, for example, Tachikawa, column 9, lines 32-39, which shows executing the relocation program, i.e. the migration plan, to move the data accordingly).

With respect to claim 5 (original), Tachikawa in view of Sakaki further discloses:

(a) setting a performance goal for said at least one executing application (see, for example, Tachikawa, column 9, lines 12-21, which shows setting a predetermined load requirement, i.e. a performance goal); and

(b) wherein said monitoring of said performance is conducted at a periodic sampling interval (see, for example, Tachikawa, column 10, line 64 to column 11, line 10, which shows monitoring the load or performance conditions at a periodic interval).

With respect to claim 6 (original), Tachikawa in view of Sakaki further discloses modifying said rate after said periodic sampling interval in response to said performance of said at least one executing application (see, for example, Tachikawa, column 12, lines 7-13 and 34-41, which shows controlling the moving based on the monitored load condition).

With respect to claim 7 (original), Tachikawa in view of Sakaki further discloses increasing said rate in response to said performance of said at least one

executing application exceeding said performance goal (see, for example, Tachikawa, column 12, lines 52-61, which shows performing additional moving if the load is minimal, i.e. increasing the rate of moving if performance exceeds the goal).

With respect to claim 8 (original), Tachikawa in view of Sakaki further discloses decreasing said rate in response to said performance of said at least one executing application not achieving said performance goal (see, for example, Tachikawa, column 12, line 62 to column 13, line 5, which shows performing less moving if the load is such that less time is available, i.e. decreasing the rate of moving if performance does not achieve the goal).

With respect to claim 9 (original), Tachikawa in view of Sakaki further discloses:

(a) setting a violation goal, wherein said violation goal is a maximum percentage of performance violations of all accesses (see, for example, Tachikawa, column 9, lines 40-50, which shows setting a predetermined suspension requirement, i.e. a violation goal, and column 11, lines 11-15, which shows that such load values may be expressed as percentages); and

(b) restricting, based on the results of said monitoring, said performance violations not to exceed said violation goal (see, for example, Tachikawa, column 10, lines 5-22, which shows suspending or restricting the moving in response to exceeding the violation goal).

With respect to claim 10 (original), Tachikawa in view of Sakaki further discloses the limitation wherein said set of data is moved in increments of portions contained within a logical volume (see, for example, Tachikawa, column 7, lines 49-58 and column 8, lines 28-35, which show that the data is stored and moved in blocks contained within a logical volume).

With respect to claim 11 (currently amended), Tachikawa discloses a system for migrating data on a computer system (see, for example, the title and abstract), said system comprising:

(a) a monitor configured to monitor a performance of at least one application executing on said computer system (see, for example, column 13, lines 6-15, which shows a monitor for monitoring the load or performance conditions of the system while moving the data, and column 10, lines 51-63, which shows that the monitored load condition may be associated with an executing application, such as one operative to record and reproduce image data);

(b) a controller configured to compare said performance with a performance goal of said at least one application (see, for example, column 9, lines 12-21, which shows a controller for comparing the current load conditions with a predetermined load requirement, i.e. a performance goal); and

(c) an actuator configured to adjust a rate of movement of a set of data from one location in said computer system to another location in said computer system (see, for example, column 7, lines 40-48, which shows an actuator for relocating or moving data in compliance with the controller).

Although Tachikawa discloses that said controller is further configured to adjust said rate of movement in response to said comparison of said performance and said performance goal (see, for example, column 12, lines 7-13 and 34-41, which shows controlling the movement based on the load or performance comparison), Tachikawa does not expressly disclose the limitation wherein said controller is further configured to calculate a change in said rate of movement in response to said comparison of said performance and said performance goal and adjust said rate of movement in accordance with the calculated change.

However, Sakaki similarly discloses a system for migrating data on a computer system (see, for example, the title and abstract). Sakaki further discloses adjusting the migration speed, i.e. adjusting the rate of movement (see, for example, column 8, lines 32-36), according to changes in rates calculated based on comparisons of performance (see, for example, column 8, lines 17-23 and 26-31). The data migration of Sakaki enables improved performance and improved access by the CPU (see, for example, column 2, lines 55-59).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to supplement the system of Tachikawa with the features taught by Sakaki, so as to configure said controller to calculate a change in said rate of movement in response to said comparison of said performance and said performance goal and adjust said rate of movement in accordance with the calculated change, thereby improving performance and access to the data.

With respect to claim 12 (original), Tachikawa in view of Sakaki further discloses a logical volume mover configured to move data in increments of portions contained within a logical volume, wherein said actuator is further configured to issue commands to a manager of said logical volume to adjust said rate of movement of said set of data (see, for example, Tachikawa, column 7, lines 40-48, which shows a logical volume mover for relocating or moving data in compliance with a manager, and column 12, lines 7-13 and 34-41, which shows controlling the movement based on the load or performance comparison; also see, for example, Tachikawa, column 7, lines 49-58 and column 8, lines 28-35, which show that the data is stored and moved in blocks contained within a logical volume).

With respect to claim 13 (original), Tachikawa in view of Sakaki further discloses a planner configured to generate a migration plan in response to an input of an initial placement map of said set of data and a target placement map of said set of data, wherein said migration plan is configured to provide a partially ordered set of moves for said set of data and to be executed by said actuator (see, for example, Tachikawa, column 9, lines 22-31, which shows a planner for

selecting a relocation program, i.e. a migration plan, based on data location information, i.e. placement maps, and column 9, lines 32-39, which shows executing the program or plan to move the data accordingly; also see, for example, Tachikawa, column 7, lines 22-33, which shows the data location information, FIG. 5A, which shows an initial placement map of the data, and FIGS. 5B and 5C, which show target placement maps; also see, for example, Tachikawa, column 10, lines 23-33, which show that the relocation comprises a sequential set of moves).

With respect to claim 14 (original), Tachikawa in view Sakaki further discloses the limitation wherein said actuator is further configured to issue a command to increase said rate of movement of said set of data in response to said controller determining said performance exceeds said performance goal (see, for example, Tachikawa, column 12, lines 52-61, which shows performing additional moving if the load is minimal, i.e. increasing the rate of movement if performance exceeds the goal).

With respect to claim 15 (original), Tachikawa in view of Sakaki further discloses the limitation wherein said actuator is further configured to issue a command to reduce said rate of movement of said set of data in response to said controller determining performance does not achieve said performance goal (see, for example, Tachikawa, column 12, line 62 to column 13, line 5, which shows performing less moving if the load is such that less time is available, i.e. decreasing the rate of movement if performance does not achieve the goal).

With respect to claim 16 (currently amended), Tachikawa discloses a computer readable storage medium on which is embedded one or more computer programs, said one or more computer programs implementing a method for migrating data on a computer system (see, for example, the title and abstract, and column 8, lines 36-45). The limitations of claim 16 are analogous to the limitations recited in claim 1 (therefore, see Tachikawa and Sakaki as applied to claim 1 above).

With respect to claim 17 (original), the limitations of the claim are analogous to the limitations recited in claim 4 (therefore, see Tachikawa and Sakaki as applied to claim 4 above).

With respect to claim 18 (original), the limitations of the claim are analogous to the limitations recited in claim 5 (therefore, see Tachikawa and Sakaki as applied to claim 5 above).

With respect to claim 19 (original), the limitations of the claim are analogous to the limitations recited in claim 9 (therefore, see Tachikawa and Sakaki as applied to claim 9 above).

With respect to claim 20 (original), the limitations of the claim are analogous to the limitations recited in claim 6 (therefore, see Tachikawa and Sakaki as applied to claim 6 above).

With respect to claim 21 (new), Tachikawa in view of Sakaki further discloses:

(a) calculating an error value for the performance of said at least one executing application (see, for example, Sakaki, column 7, line 63 to column 8, line 2, which shows determining or calculating a contention value, i.e. an error value); and

(b) using said error value to calculate said change in said rate of said moving according to a control theory technique (see, for example, Sakaki, column 8, lines 17-23 and 26-36, which shows using the contention or error values to calculate the changes in rates for modifying the migration speed, i.e. for modifying the rate of moving; also see, for example, Sakaki, column 8, lines 20-22 and 29-31, which shows using past information, i.e. feedback information, in the calculations, such as according to a control theory technique).

With respect to claim 22 (new), Tachikawa in view of Sakaki further discloses the limitation wherein said controller is further configured to calculate an error value for said performance of said at least one application (see, for example, Sakaki, column 7, line 63 to column 8, line 2, which shows determining or calculating a contention value, i.e. an error value) and to calculate said change in said rate of movement using said error value in at least one control theory equation (see, for example, Sakaki, column 8, lines 17-23 and 26-36, which shows calculating the changes in rates to adjust the migration speed, i.e. to adjust the rate of movement, using the contention or error values; also see, for example, Sakaki, column 8, lines 20-22 and 29-31, which shows using past information, i.e. feedback information, in the calculations, such as in a control theory equation).

With respect to claim 23 (new), the limitations of the claim are analogous to the limitations recited in claims 11 and 22 (therefore, see Tachikawa and Sakaki as applied to claims 11 and 22 above).

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

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